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Docket No. AMDP714USAF01159**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**In re **PATENT** application of:

Applicant: Angela Hui, et al.

Application No.: 10/045,354

For: AN INNOVATIVE METHOD OF HARD MASK REMOVAL

Filing Date: November 7, 2001

Examiner: Khiem D Nguyen

Art Unit: 2823

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TECHNOLOGY CENTER 2800**REPLY TO OFFICE ACTION DATED JULY 24, 2003**

Mail Stop Non-Fee Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

Favorable reconsideration of the above-identified application is respectfully requested in view of the following amendments and remarks.

REMARKS

Claims 1-24 and 27 are pending in the application. Applicants note with appreciation the allowance of claims 19-24, and the provisional allowance of claims 2-18. Reconsideration of the application in light of the following remarks is respectfully requested.

I. OBJECTION TO CLAIMS 1 AND 27 UNDER 37 C.F.R. § 1.75

Claims 1 and 27 were objected to under 37 C.F.R. §1.75 as being substantial duplicates of each other. It is respectfully submitted that claims 1 and 27 are not duplicate claims for at least the following reasons.

MPEP § 706.03(k) states the following:

Inasmuch as a patent is supposed to be limited to only one invention or, at most, several closely related indivisible inventions, limiting an application to a single claim, or a single claim to each of the related inventions might appear to be logical as well as convenient. However, court decisions have confirmed applicant's right to restate (*i.e.*, by plural claiming) the invention in a reasonable number of ways. ***Indeed, a mere difference in scope between claims has be held to be enough.***

Nevertheless, when two claims in an application are duplicates, or else are so close in content that they both cover the same thing, despite a slight difference in wording, it is proper after allowing one claim to object to the other claim under 37 CFR 1.75 as being a substantial duplicate of the allowed claim. (Emphasis added).

It is respectfully submitted that ***claims 1 and 27 are not duplicate claims because they differ in scope from one another.*** More particularly, claim 27 does ***not*** contain a limitation (that exists in claim 1) that the single plasma etch process ***substantially completely*** remove the sacrificial material and the hard mask. ***Thus claim 1 is more narrow in scope than claim 27.*** More particularly, while claim 1 requires that the single plasma etch process substantially completely remove the sacrificial material and the hard mask in that single step, claim 27 does not require a substantially complete removal of both the sacrificial material and the hard mask. Therefore in accordance with MPEP § 706.03(k), claims 1 and 27 are not duplicate claims; accordingly, withdrawal of the objection is respectfully requested.

II. BROADER CLAIM 27 IS PATENTABLE OVER THE CITED ART OF RECORD

Claim 1 is patentable over the cited art of record for the same reasons as set forth in the "Reasons for Allowance" in the Office Action of July 24, 2003. In addition, It is respectfully submitted that the cited art do not teach the invention of claim 27 (that is broader in scope than claim 1) for at least the following reasons.

- i. ***Neither Hemmenway et al. nor Bothra teach plasma etching to strip the sacrificial material and the hard mask in a single etch process as recited in claim 27.***

Claim 27 is directed to a method of stripping a hard mask from a substrate. The method comprises coating the substrate with a sacrificial material that fills gaps in a hard mask, and ***plasma etching to strip the sacrificial material and the hard mask in a single plasma etch process***. Hemmenway et al. not only do not teach the above feature, but ***require*** the removal of materials be performed ***in a multi-step process***. As averred in the Office Action, the photoresist or buffer material 51 and the hard mask 11 of Hemmenway et al. are interpreted as the recited sacrificial layer and hard mask, respectively. In discussing removal of the buffer material 51 and the hard mask 11, ***a two-step removal process is employed*** (see, e.g., Col. 3, ln. 46 - Col. 4, ln. 26). More particularly, ***Hemmenway et al. require a multi-step removal process by requiring the buffer material be selective with respect to the hard mask***. For example, the reference states:

In the foregoing example, the only limitation on the choice of buffer material 51 is that it be selective with respect to the materials that are used for the 'hard' mask layer 11 and the buried layer 21.... (Col. 4, lns. 5-8).

Therefore not only does Hemmenway et al. not teach a single step plasma etch to strip sacrificial material and the hard mask, ***the cited reference prohibits a single step solution by requiring etch selectivity between the two materials***. Therefore the art does not teach the claim feature, and ***one of ordinary skill in the art (upon evaluating Hemmenway et al. as a whole) would not be motivated to modify the art in accordance with the present invention because doing so would contravene the teaching therein***. Therefore claim 1 and its associated depending claims are non-obvious over the cited art. Accordingly, withdrawal of the rejection is respectfully requested.

ii. *Even if the cited art could be combined properly, Bothra does not teach plasma etching of a hard mask as recited in claim 27.*

The Office Action concedes that Hemmenway et al. has deficiencies, but asserts that Bothra remedies such deficiencies. More particularly, the Office Action avers that Bothra discloses a plasma etching of a hard mask layer using CHF_3/O_2 (see O.A., 4/2/03, p. 3, last paragraph). ***Bothra, however, does not utilize the silicon nitride layer 209 cited in the Office Action as a hard mask. Rather, the layer 209 is employed as an etch stop layer for the etching of an overlying dielectric layer***, as clearly seen in Fig. 5 and in the accompanying text. As seen therein, a photoresist layer 218 is employed as an etch mask to pattern the dielectric material 216, wherein the etch stops on the silicon nitride layer 209 (hence layer 209 is an etch stop). Then, as clearly seen in Fig. 6 and discussed in the accompanying text, the silicon nitride layer 209 is etched; during such etch, the photoresist mask 218 is maintained and thus the etch is selective with respect to the photoresist. Thus the photoresist mask 218 may be considered as a hard mask, not the silicon nitride layer 209. Therefore one of ordinary skill in the art, upon evaluating the teaching of Bothra as a whole, would not be motivated to combine the teachings thereof to employ the etch chemistry discussed therein for the silicon nitride etch stop layer 209 in conjunction with Hemmenway et al. which is directed to removal of the hard mask.

Further, even if such a combination were proper, such teachings would not provide the present invention since in both cases, the etch processes taught therein are directed to multi-step removal processes in direct contravention with applicants' claim language. Therefore for this additional reason, the claim at issue is non-obvious over the cited references.

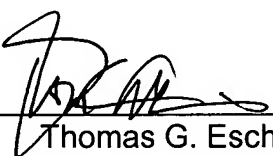
III. CONCLUSION

For at least the above reasons, the claims currently under consideration are believed to be in condition for allowance.

Should the Examiner feel that a telephone interview would be helpful to facilitate favorable prosecution of the above-identified application, the Examiner is invited to contact the undersigned at the telephone number provided below.

Should any fees be due as a result of the filing of this response, the Commissioner is hereby authorized to charge the Deposit Account Number 50-1733, AMDP714US.

Respectfully submitted,
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CERTIFICATE OF MAILING (37 CFR 1.8a)

I hereby certify that this paper (along with any paper referred to as being attached or enclosed) is being deposited with the United States Postal Service on the date shown below with sufficient postage as first class mail in an envelope addressed to: Mail Stop Non-Fee Amendment, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

Date: July 31, 2003


Christine Gillroy